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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/034,689 | SATISH JAMADAGNI, NANJUNDA SWAMY | |
| | **Examiner** | **Art Unit** | |
| | Mai T. Tran | 2129 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *20 August 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-63* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-63* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

**DETAILED ACTION**

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicants' submission filed on August 20, 2008 has been entered.

Claims 1, 11, 22, 25, 33, and 41 have been amended. No new claims have been added. Claims 1-63 remain pending in the application and which have been fully considered by the examiner.

**SPECIFICATION**

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required:

**Claims 25-32** recite the limitation of "*A computer-readable medium*", which is not defined in the specification as one of ordinary skill in the art would be able to determine the metes and bounds of "computer-readable medium." It is unclear what Applicants consider as "computer-readable medium."

## CLAIM OBJECTIONS

**Claim 11** is objected to because of the following informalities:

- Claim 11 recites in the preamble "*The method of claim 3, wherein sampling the incoming real-time events comprises*" It should be "The method of claim 3, wherein sampling a portion of the incoming real-time events."

Appropriate correction is required.

## CLAIM REJECTIONS - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

**Claims 1-63** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s),

at the time the application was filed, had possession of the claimed invention.

Claims 1, 11, 22, 25, 33, and 41 recite the new limitation "*sampling* ***a portion***", which has been found inadequately and/or insufficiently disclosed.

In the remarks, page 16 Applicant cites page 15, line 10 of the specification and page 3 lines 15-16 to allegedly support the new claimed limitation. However, the cited pages are silent about "sampling **a portion**". Applicant has not even provided any mechanism, structure, or condition on how "sampling a portion" is being done. How does applicant determine where the start and/or the end of "a portion" are, i.e. what incoming real-time events will be included in "a portion".

## CLAIM REJECTIONS - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for

establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

1. **Claims 1-18, 22-31, 33-39, 41-58, and 62-63** are rejected under 35 U.S.C. 103(a) as being unpatentable over "**Computational Intelligence for Distributed Fault Management in Networks Using Fuzzy Cognitive Maps**", by Ndousse et al, hereinafter **Ndousse**, and further in view of **Greineder** et al, U. S. Patent No. 6,137,909.

**Claim 1**

Ndousse teaches a method to diagnose a problem from multiple events in a system of managed components generating real-time events of problems, comprising:

forming fuzzy cognitive maps (*Ndousse, FCMs, see e.g., abstract or Fig. 2*) including causally equivalent FCM fragments (*Ndousse, FCMs inherently comprise of fragments comprising of one or more nodes*) using network element interdependencies derived from a database defining the network managed objects and event notifications that convey the state of one or more managed objects *(Ndousse, title, abstract, page 1559, left col., line 26, lines 29-30, lines 36-37, page 1558, right col., lines 1-6, last 3 lines*);

sampling a portion (*Greineder, col. 5 lines 49-52*) of generated incoming real-time events from the system (*Ndousse, see e.g., time varying aspects, abstract; fault management, rapid solution, and/or very rapid detection, page 1558, left col., lines 5-36, paragraph I, lines 2-3*); and

diagnosing problems by mapping the sampled events to the formed FCM fragments (*Ndousse, page 1558, left col., lines 1-36*).

Ndousse teaches substantially all of Applicants' claimed invention. Ndousse also teaches sampling generated incoming

real-time events from the system. Ndousse fails to particularly call for "*sampling a portion*" (which is not further defined in the claims) of events.

Greineder discloses "*sampling a subset of the exemplars from each of the event classes*" (see e.g., *Greineder, col. 5 lines 49-52*).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine Ndousse with Greineder.

The motivation for doing so would be to differentiate known events and unknown events (*Greineder, col. 5 lines 30-33*).

**Claim 2**

Ndousse in combination with Greineder teach the method of claim 1, wherein forming the FCM fragments comprises:

determining event nodes (*Ndousse, event nodes simply read on literal events; in a network management or fault management system, an event can be a notification that something is wrong or that some type of failure occurred, see e.g., fault propagation, pgs. 1558-1559*) from events in the database (*Ndousse, page 1558, right col., especially last 4 lines; page 1559, left col., especially lines 41-42; page 1560 and the paragraph under Figure 5*);

identifying concept nodes (*Ndousse, concepts, pg. 1559, lines 34-41 read on decision points in the FCM, Fig. 2; see also concept nodes, under Fig. 5, pg. 1560*) from the determined event nodes (*Ndousse, see how the concepts are determined from the actual events of a fault occurring, see "Models of Fault Propagation, pgs. 1559-1560, especially pg. 1559, left col., lines 41-42, or pg. 1560, paragraph under Figure 5*); and

forming FCM fragments (*Ndousse, one or more nodes of an FCM*) including interdependencies (*Ndousse, clearly the concept node depend on events/faults actually occurring or modeling of a hypothetical situation where faults occur*) between the concept and event nodes using the determined event nodes and the identified concept nodes (*Ndousse, page 1559, left col., lines 41-42, page 1560, paragraph under Figure 5*).

**Claim 3**

Ndousse in combination with Greineder teach the method of claim 2, wherein diagnosing the sampled events comprises:

mapping the sampled real-time events to the formed FCM fragments including determined event nodes to evaluate the effect of the mapped event nodes on the identified concept nodes using the determined interdependencies (*Ndousse, page 1559, Figure 2*);

identifying the problems by analyzing the concept nodes based on the outcome of the evaluation (*Ndousse, e.g., pgs. 1558-1561, especially pg. 1559, Figure 2*); and

diagnosing the problems based on the outcome of the analysis (*Ndousse*, e.g., *page 1559, Figure 2*).

**Claim 4**

Ndousse in combination with Greineder teach the method of claim 3, wherein the system comprises:

a system selected from the group consisting of explicit system, implicit system, centralized system, partially centralized system, and distributed system (*Ndousse, see e.g., page 1558, or title*).

**Claim 5**

Ndousse in combination with Greineder teach the method of claim 3, wherein the events comprise:

exceptional conditions occurring in the operation of the network (*Ndousse, e.g., routers failing, links/transmission lines failing, page 1558, left col., lines 32-33*).

**Claim 6**

Ndousse in combination with Greineder teach the method of claim 5, wherein the event nodes comprise:

significant events selected from the group consisting of hardware failures (*e.g., a router/link*), software failures

(*Ndousse, e.g., a protocol*), performance bottlenecks (*e.g., congestion, e.g., Figs. 2-5*), configuration problems (*Ndousse, e.g., links failing*) , and security violations (*Ndousse, links being broken or becoming unsecured, page 1558, left col., lines 32-33*).

**Claim 7**

Ndousse in combination with Greineder teach the method of claim 6, wherein determining the event nodes comprises:

determining the event nodes from a database defining the network managed objects and event notifications that convey the state of one or more managed objects. (*Examiner interprets the database as Management Information Base. Official notice is taken that a Management Information Base (MIB) is a set of objects that represents various types of information about a device, used by a network management protocol to manage the device*).

**Claim 8**

Ndousse in combination with Greineder teach the method of claim 7, wherein determining the event nodes further comprises:

determining the event nodes from expert knowledge (*not further defined*) of the network (*Ndousse, page 1559, left col., lines 1-3*).

**Claim 9**

Ndousse in combination with Greineder teach the method of claim 8, wherein the managed objects comprise:

objects selected from the group consisting of network objects, attached systems, and application objects (*Ndousse, page 1558, right col., line 10*).

**Claim 10**

Ndousse in combination with Greineder teach the method of claim 8, wherein the database comprises:

static information associated with each class of managed or dynamic information that affects the causal propagation of events (*Ndousse, page 1558, right col., last 2 lines*). (*Examiner interprets the database as Management Information Base. Official notice is taken that a Management Information Base (MIB) is a set of objects that represents various types of information about a device, used by a network management protocol to manage the device*).

**Claim 11**

Ndousse in combination with Greineder teach the method of claim 3, wherein sampling the incoming real-time events comprises:

sampling a portion (*Greineder, col. 5 lines 49-52*) the incoming real-time events sequentially in the order they are

received (*Ndousse, page 1558, left col., lines 5-36, paragraph I, lines 2-3*).

**Claim 12**

Ndousse in combination with Greineder teach the method of claim 3, wherein identifying the concept nodes comprises:

identifying a composite set of events that capture the notion of an abstract exception condition in the network (*Ndousse, e.g., page 1560, Figure 5*).

**Claim 13**

Ndousse in combination with Greineder teach the method of claim 12, wherein the abstract exception condition comprises:

abstract exception conditions selected from the group consisting of a notion of fault and a notion of performance degradation, a network card in a communication system being faulty with the number of users being served by the communication system drastically reducing, and link between two routers going down leading to the use of alternate paths which lead to congestion and performance (*Ndousse, pgs. 1558-1561, especially page 1561, left col., lines 10-11, 14, right col., lines 1-3*).

**Claim 14**

Ndousse in combination with Greineder teach the method of claim 12, wherein capturing (*Ndousse, e.g., collecting, polling, or determining)* the abstract exception condition comprises:

capturing normal paths based on predetermined criteria on which the events have to be diagnosed (*Ndousse, page 1558, left col., lines 6-13*).

**Claim 15**

Ndousse in combination with Greineder teach the method of claim 14, wherein the criteria comprises:

causal and temporal inconsistencies between events (*Ndousse, page 1558, left col., lines 6-13*).

**Claim 16**

Ndousse in combination with Greineder teach the method of claim 1, wherein forming the FCM, comprises:

capturing system event interdependencies (*Ndousse, page 1559, left col., lines 36-40*).

**Claim 17**

Ndousse in combination with Greineder teach the method of claim 15, wherein capturing the system event interdependencies comprises:

interconnecting event and concept nodes using interdependency arcs capturing temporal and logical dependencies (*Ndousse, page 1559, left col., lines 36-40*).

**Claim 18**

Ndousse in combination with Greineder teach the method of claim 17, wherein the interdependency arcs comprise:

weights based on temporal and logical dependencies (*Ndousse, page 1559, left col., lines 42-45*).

**Claim 22**

Ndousse in combination with Greineder teach a method for diagnosing problems from multiple events in a communication network including managed components generating real-time events of problems, comprising:

forming fuzzy cognitive maps (*Ndousse, FCMs, see e.g., abstract or Fig. 2*) including causally equivalent FCM fragments (*FCMs inherently comprise of fragments comprising of one or more nodes*) using network element interdependencies (*Ndousse, page 1559, left col., line 26, lines 29-30, lines 36-37, page 1558, right col., lines 1-6, last 3 lines*);

sampling a portion (*Greineder, col. 5 lines 49-52*) of generated incoming real-time events from the network (*Ndousse, see e.g., time varying aspects, abstract; fault management,*

*rapid solution, and/or very rapid detection, page 1558, left col., lines 5-36, paragraph I, lines 2-3*); and

diagnosing each of the problems by mapping the received sampled events to the formed FCM fragments (*Ndousse, page 1558, left col., lines 1-36*).

**Claim 23**

Ndousse in combination with Greineder teach the method of claim 22, wherein forming the FCM fragments comprises:

determining event nodes (*Ndousse, event nodes simply read on literal events; in a network management or fault management system, an event can be a notification that something is wrong or that some type of failure occurred, see e.g., fault propagation, pgs. 1558-1559*) from events in the database (*Ndousse, page 1558, right col., especially last 4 lines; page 1559, left col., especially lines 41-42; page 1560 and the paragraph under Figure 5*);

identifying concept nodes (*Ndousse, concepts, pg. 1559, lines 34-41 read on decision points in the FCM, Fig. 2; see also concept nodes, under Fig. 5, pg. 1560*) from the determined event nodes (*see how the concepts are determined from the actual events of a fault occurring, see "Models of Fault Propagation, pgs. 1559-1560, especially pg. 1559, left col., lines 41-42, or pg. 1560, paragraph under Figure 5*); and

forming FCM fragments (*Ndousse, one or more nodes of an FCM*) including interdependencies (*Ndousse, clearly the concept node depend on events/faults actually occurring or modeling of a hypothetical situation where faults occur*) between the concept and event nodes using the determined event nodes and the identified concept nodes (*Ndousse, page 1559, left col., lines 41-42, page 1560, paragraph under Figure 5*).

**Claim 24**

Ndousse in combination with Greineder teach the method of claim 23, wherein diagnosing the sampled events comprises:

mapping the sampled real-time events to the formed FCM fragments including determined event nodes to evaluate the effect of the mapped event nodes on the identified concept nodes using the determined interdependencies (*Ndousse, page 1559, Figure 2*);

identifying the problems by analyzing the concept nodes based on the outcome of the evaluation (*Ndousse, e.g., pgs. 1558-1561, especially pg. 1559, Figure 2*); and

diagnosing the problems based on the outcome of the analysis (*Ndousse, e.g., page 1559, Figure 2*).

**Claim 25**

Ndousse in combination with Greineder teach a computer readable medium having computer-executable instructions to

diagnose problems from multiple events in a system of managed components generating real-time events of problems, comprising (*Ndousse, page 1562, right col., lines 18-21*):

forming fuzzy cognitive maps (*Ndousse, FCMs, see e.g., abstract or Fig. 2*) including causally equivalent FCM fragments (*Ndousse, FCMs inherently comprise of fragments comprising of one or more nodes*) using network element interdependencies derived from a database defining the network managed objects and event notifications that convey the state of one or more managed objects *(Ndousse, title, abstract, page 1559, left col., line 26, lines 29-30, lines 36-37, page 1558, right col., lines 1-6, last 3 lines*);

sampling a portion (*Greineder, col. 5 lines 49-52*) generated incoming real-time events from the system (*Ndousse, see e.g., time varying aspects, abstract; fault management, rapid solution, and/or very rapid detection, page 1558, left col., lines 5-36, paragraph I, lines 2-3*); and

diagnosing problems by mapping the sampled events to the formed FCM fragments (*Ndousse, page 1558, left col., lines 1-36*).

**<u>Claim 26</u>**

Ndousse in combination with Greineder teach the computer readable medium of claim 25, wherein forming the FCM fragments comprises:

determining event nodes (*Ndousse, event nodes simply read on literal events; in a network management or fault management system, an event can be a notification that something is wrong or that some type of failure occurred, see e.g., fault propagation, pgs. 1558-1559*) from events in the database (*Ndousse, page 1558, right col., especially last 4 lines; page 1559, left col., especially lines 41-42; page 1560 and the paragraph under Figure 5*);

identifying concept nodes (*Ndousse, concepts, pg. 1559, lines 34-41 read on decision points in the FCM, Fig. 2; see also concept nodes, under Fig. 5, pg. 1560*) from the determined event nodes (*Ndousse, see how the concepts are determined from the actual events of a fault occurring, see "Models of Fault Propagation, pgs. 1559-1560, especially pg. 1559, left col., lines 41-42, or pg. 1560, paragraph under Figure 5*); and

forming FCM fragments (*Ndousse, one or more nodes of an FCM*) including interdependencies (*Ndousse, clearly the concept node depend on events/faults actually occurring or modeling of a hypothetical situation where faults occur*) between the concept and event nodes using the determined event nodes and the

identified concept nodes (*Ndousse, page 1559, left col., lines 41-42, page 1560, paragraph under Figure 5*).

**Claim 27**

Ndousse in combination with Greineder teach the computer readable medium of claim 26, wherein diagnosing the sampled events comprises:

mapping the sampled real-time events to the formed FCM fragments including determined event nodes to evaluate the effect of the mapped event nodes on the identified concept nodes using the determined interdependencies (*Ndousse, page 1559, Figure 2*);

identifying the problems by analyzing the concept nodes based on activation levels of the concept nodes (*Ndousse, e.g., pgs. 1558-1561, especially pg. 1559, Figure 2*); and

diagnosing the problems based on the outcome of the analysis (*Ndousse, e.g., page 1559, Figure 2*).

**Claim 28**

Ndousse in combination with Greineder teach the computer readable medium of claim 27, wherein the system comprises:

a system selected from the group consisting of explicit system, implicit system, centralized system, partially centralized system, and distributed system (*Ndousse, see e.g., page 1558, or title*).

**Claim 29**

Ndousse in combination with Greineder teach the computer readable medium of claim 28, wherein the events comprise:

exceptional conditions occurring in the operation of the network (*Ndousse, e.g., routers failing, links/transmission lines failing, page 1558, left col., lines 32-33*).

**Claim 30**

Ndousse in combination with Greineder teach the computer readable medium of claim 29, wherein the event nodes comprise:

significant events selected from the group consisting of hardware failures (*Ndousse, e.g., a router/link*), software failures (*Ndousse, e.g., a protocol*), performance bottlenecks (*Ndousse, e.g., congestion, e.g., Figs. 2-5*), configuration problems (*Ndousse, e.g., links failing*) , and security violations (*Ndousse, links being broken or becoming unsecured, page 1558, left col., lines 32-33*).

**Claim 31**

Ndousse in combination with Greineder teach the computer readable medium of claim 27, wherein identifying the concept nodes comprises:

identifying a composite set of events that capture the notion of an abstract exception condition in the network (*Ndousse, page 1560, Figure 5*).

**Claim 33**

Ndousse in combination with Greineder teach a computer system to diagnose problems from multiple events in a system of managed components generating real-time events of problems, comprising:

a storage device;

an output device; and

a processor programmed to repeatedly perform a method, comprising *(Ndousse, page 1562, right col., lines 18-21). (Software is run on a computer system. Official notice is taken that a computer comprises a storage device, an output device, and a processor)*:

forming fuzzy cognitive maps (*Ndousse, FCMs, see e.g., abstract or Fig. 2*) including causally equivalent FCM fragments (*Ndousse, FCMs inherently comprise of fragments comprising of one or more nodes*) using network element interdependencies derived from a database defining the network managed objects and event notifications that convey the state of one or more managed objects *(Ndousse, title, abstract, page 1559, left col., line 26, lines 29-30, lines 36-37, page 1558, right col., lines 1-6, last 3 lines*);

sampling a portion of (*Greineder, col. 5 lines 49-52*) generated incoming real-time events from the system (*Ndousse,*

*see e.g., time varying aspects, abstract; fault management, rapid solution, and/or very rapid detection, page 1558, left col., lines 5-36, paragraph I, lines 2-3*); and

diagnosing problems by mapping the sampled events to the formed FCM fragments (*Ndousse, page 1558, left col., lines 1-36*).

**Claim 34**

Ndousse in combination with Greineder teach the system of claim 33, wherein forming the FCM fragments comprises:

determining event nodes (*Ndousse, event nodes simply read on literal events; in a network management or fault management system, an event can be a notification that something is wrong or that some type of failure occurred, see e.g., fault propagation, pgs. 1558-1559*) from events in the database (*Ndousse, page 1558, right col., especially last 4 lines; page 1559, left col., especially lines 41-42; page 1560 and the paragraph under Figure 5*);

identifying concept nodes (*Ndousse, concepts, pg. 1559, lines 34-41 read on decision points in the FCM, Fig. 2; see also concept nodes, under Fig. 5, pg. 1560*) from the determined event nodes (*Ndousse, see how the concepts are determined from the actual events of a fault occurring, see "Models of Fault*

*Propagation, pgs. 1559-1599, especially pg. 1559, left col., lines 41-42, or pg. 1560, paragraph under Figure 5*); and

forming FCM fragments (*Ndousse, one or more nodes of an FCM*) including interdependencies (*Ndousse, clearly the concept node depend on events/faults actually occurring or modeling of a hypothetical situation where faults occur*) between the concept and event nodes using the determined event nodes and the identified concept nodes (*Ndousse, page 1559, left col., lines 41-42, page 1560, paragraph under Figure 5*).

**Claim 35**

Ndousse in combination with Greineder teach the system of claim 34, wherein diagnosing the sampled events comprises:

mapping the sampled real-time events to the formed FCM fragments including determined event nodes to evaluate the effect of the mapped event nodes on the identified concept nodes using the determined interdependencies (*Ndousse, page 1559, Figure 2*);

identifying the problems by analyzing the concept nodes based on the outcome of the evaluation (*Ndousse, e.g., pgs. 1558-1561, especially pg. 1559, Figure 2*); and

diagnosing the problems based on the outcome of the analysis (*Ndousse, e.g., page 1559, Figure 2*).

**Claim 36**

Ndousse in combination with Greineder teach the system of claim 35, wherein the events comprise:

exceptional conditions occurring in the operation of the network (*Ndousse, e.g., routers failing, links/transmission lines failing, page 1558, left col., lines 32-33*).

**Claim 37**

Ndousse in combination with Greineder teach the system of claim 35, wherein the event nodes comprise:

significant events selected from the group consisting of hardware failures (*Ndousse, e.g., a router/link*), software failures (*Ndousse, e.g., a protocol*), performance bottlenecks (*Ndousse, e.g., congestion, e.g., Figs. 2-5*), configuration problems (*Ndousse, e.g., links failing*) , and security violations (*Ndousse, links being broken or becoming unsecured, page 1558, left col., lines 32-33*).

**Claim 38**

Ndousse in combination with Greineder teach the system of claim 35, wherein identifying the concept nodes comprises:

identifying a composite set of events that capture the notion of an abstract exception condition in the network (*Ndousse, page 1560, Figure 5*).

**Claim 39**

Ndousse in combination with Greineder teach the system of claim 35, wherein forming the FCM, comprises:

capturing system event interdependencies by interconnecting event and concept nodes using interdependency arcs that capture temporal and logical dependencies (*Ndousse, page 1559, left col., lines 36-40*).

**Claim 41**

Ndousse in combination with Greineder teach an event-correlation system to diagnose problems from multiple incoming real-time events in a communication network of managed components generating real-time events of problems, comprising:

an event-analyzer to form fuzzy cognitive maps (*Ndousse, FCMs, see e.g., abstract or Fig. 2*) fragments (*Ndousse, FCMs inherently comprise of fragments comprising of one or more nodes*) using network element interdependencies derived from a database defining the network managed objects and event notifications that convey the state of one or more managed objects *(Ndousse, title, abstract, page 1559, left col., line 26, lines 29-30, lines 36-37, page 1558, right col., lines 1-6, last 3 lines)*; and

an event-processing module coupled to the event-analyzer to sample a portion of (*Greineder, col. 5 lines 49-52*) generated

incoming real-time events from the network (*Ndousse, see e.g., time varying aspects, abstract; fault management, rapid solution, and/or very rapid detection, page 1558, left col., lines 5-36, paragraph I, lines 2-3*), wherein the analyzer to diagnose the problems from the sampled events by mapping the sampled events to the formed FCM fragments (*Ndousse, page 1558, left col., lines 1-36*).

**Claim 42**

Ndousse in combination with Greineder teach the event-correlation system of claim 41, wherein the analyzer forms FCM fragments by determining event nodes (*Ndousse, event nodes simply read on literal events; in a network management or fault management system, an event can be a notification that something is wrong or that some type of failure occurred, see e.g., fault propagation, pgs. 1558-1559*) from events in the database (*Ndousse, page 1558, right col., especially last 4 lines; page 1559, left col., especially lines 41-42; page 1560 and the paragraph under Figure 5*), and by further identifying concept nodes (*Ndousse, concepts, pg. 1559, lines 34-41 read on decision points in the FCM, Fig. 2; see also concept nodes, under Fig. 5, pg. 1560*) from the determined event nodes (*Ndousse, see how the concepts are determined from the actual events of a fault occurring, see "Models of Fault Propagation, pgs. 1559-1599,*

*especially pg. 1559, left col., lines 41-42, or pg. 1560, paragraph under Figure 5*) to form FCM fragments (*Ndousse, one or more nodes of an FCM*) including interdependencies (*Ndousse, clearly the concept node depend on events/faults actually occurring or modeling of a hypothetical situation where faults occur*) between the identified concept nodes and the determined event nodes (*Ndousse, page 1559, left col., lines 41-42, page 1560, paragraph under Figure 5*).

**Claim 43**

Ndousse in combination with Greineder teach the event-correlation system of claim 41, wherein the analyzer further maps the sampled events to the formed FCM fragments including determined event nodes to evaluate the effect of the mapped events on the determined concept nodes using the determined interdependencies (*Ndousse, page 1559, Figure 2*), wherein the analyzer identifies the problems by analyzing the concept nodes based on the outcome of the evaluation (*Ndousse, e.g., pgs. 1558-1561, especially pg. 1559, Figure 2*) and further diagnoses the problems based on the outcome of the analysis (*Ndousse, e.g., page 1559, Figure 2*).

**Claim 44**

Ndousse in combination with Greineder teach the event-correlation system of claim 43, wherein the communication network comprises:

a system selected from the group consisting of explicit system, implicit system, centralized system, partially centralized system, and distributed system (*Ndousse, see e.g., page 1558, or title*).

**Claim 45**

Ndousse in combination with Greineder teach the event-correlation system of claim 43, wherein the events comprise:

exceptional conditions occurring in the operation of the network (*Ndousse,* e.*g., routers failing, links/transmission lines failing, page 1558, left col., lines 32-33*).

**Claim 46**

Ndousse in combination with Greineder teach the event-correlation system of claim 45, wherein the event nodes comprise:

significant events selected from the group consisting of hardware failures (*Ndousse, e.g., a router/link*), software failures (*Ndousse, e.g., a protocol*), performance bottlenecks (*Ndousse, e.g., congestion, e.g., Figs. 2-5*), configuration problems (*Ndousse, e.g., links failing*) , and security

violations (*Ndousse, links being broken or becoming unsecured, page 1558, left col., lines 32-33*).

**Claim 47**

Ndousse teaches the event-correlation system of claim 46, wherein the analyzer determines the event nodes from a database defining the network managed-objects and event notifications that convey the state of one or more managed objects. (*Examiner interprets the database as Management Information Base. Official notice is taken that a Management Information Base (MIB) is a set of objects that represents various types of information about a device, used by a network management protocol to manage the device*).

**Claim 48**

Ndousse in combination with Greineder teach the event-correlation system of claim 47, wherein the analyzer determines the event nodes from expert knowledge (*not further defined*) of the network (*Ndousse, page 1559, left col., lines 1-3*).

**Claim 49**

Ndousse in combination with Greineder teach the event-correlation system of claim 48, wherein the managed objects comprise:

objects selected from the group consisting of network objects, attached systems, and application objects (*Ndousse, page 1558, right col., line 10*).

**Claim 50**

Ndousse in combination with Greineder teach the event-correlation system of claim 48, wherein the database comprises:

static information associated with each class of managed objects or dynamic information that affects the casual propagation of events *(Ndousse, page 1558, right col., last 2 lines)*. (*Examiner interprets the database as Management Information Base. Official notice is taken that a Management Information Base (MIB) is a set of objects that represents various types of information about a device, used by a network management protocol to manage the device*).

**Claim 51**

Ndousse in combination with Greineder teach the event-correlation system of claim 43, further comprising:

a communication interface module coupled between the network and the event-processing module to extract events from real-time messages received in different formats from the network and to further sample the extracted events sequentially in the order they are received (*Ndousse, page 1558, left col., lines 5-8, paragraph I, lines 2-3*).

**Claim 52**

Ndousse in combination with Greineder teach the event-correlation system of claim 43, wherein the analyzer identifying the concept nodes comprises a composite set of events that capture a notion of an abstract exception condition in the network (*Ndousse, e.g., page 1560, Figure 5*).

**Claim 53**

Ndousse in combination with Greineder teach the event-correlation system of claim 52, wherein the abstract exception condition comprises conditions selected from the group consisting of a notion of fault and a notion of performance degradation (*Ndousse, pgs. 1558-1561, especially page 1561, left col., lines 10-11, 14, right col., lines 1-3*).

**Claim 54**

Ndousse in combination with Greineder teach the event-correlation system of claim 52, wherein the analyzer captures (*Ndousse, e.g., collecting, polling, or determining*) the abstract exception condition by capturing normal paths based on predetermined criteria from which for the events are diagnosed (*Ndousse, page 1558, left col., lines 6-10*).

**Claim 55**

Ndousse in combination with Greineder teach the event-correlation system of claim 54, wherein the criteria comprises:

causal and temporal inconsistencies between events (*Ndousse, page 1558, left col., lines 6-13*).

**Claim 56**

Ndousse in combination with Greineder teach the event-correlation system of claim 43, wherein the analyzer forms FCM by capturing system event interdependencies (*Ndousse, page 1559, left col., lines 36-40*).

**Claim 57**

Ndousse in combination with Greineder teach the event-correlation system of claim 56, wherein the analyzer captures system interdependencies by interconnecting event and concept nodes using interdependency arcs to capture temporal and logical dependencies (*Ndousse, page 1559, left col., lines 36-40*).

**Claim 58**

Ndousse in combination with Greineder teach the event-correlation system of claim 57, wherein the interdependency arcs comprise:

weights based on temporal and logical dependencies (*Ndousse, page 1559, left col., lines 42-45*).

**Claim 62**

Ndousse in combination with Greineder teach the event-correlation system of claim 43, further comprising:

an interface output module coupled to the event-analyzer to output one or more solutions based on the outcome of diagnosing the problems by the analyzer *(Ndousse, page 1562, right col., lines 18-21). Software is run on a computer system. Official notice is taken that a computer comprises a storage device, an output device, and a processor.*

**Claim 63**

Ndousse in combination with Greineder teach the event-correlation system of claim 62, further comprising:

a memory to store the static and dynamic information. *Official notice is taken that a computer comprises a memory.*

***Claim Rejections - 35 USC § 103***

2. Claims **19-21, 32, 40, and 59-61** are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of **Ndousse and Greineder** as applied to claims 1-18, 22-31, 33-39, 41-58, and 62-63 above, further in view of "Contextual Fuzzy Cognitive Map for Decision Support in Geographic Information Systems" by Zhi-Qiang Liu et al, hereinafter **Liu**, and further in view of "Cognitive maps and fuzzy implications" by Thierry Marchant, hereinafter **Marchant.**

**Claim 19**

Ndousse-Greineder disclose substantially all of Applicants' claimed invention with the exception of the computation of an indirect effect of events.

Liu teaches the computation of an indirect effect on concepts in an FCM using the claimed equation.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify Ndousse-Greineder as taught by Liu.

The motivation for doing so would be "*for decision support based on the degree to which one concept affects another*" (*Liu, page 502, right col., paragraph IV, lines 2, 12-13*).

The combination of Ndousse, Greineder and Liu does not expressly disclose the computation of the bounded difference.

Marchant teaches the computation of the bounded difference using the claimed equation which is the fuzzy equivalents of the AND logical connective of two sets.

Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine Ndousse-Greineder-Liu as taught by Marchant.

The motivation for doing so would be "*in order to find what are the elements of a system on which we eventually could act in order to modify the system based on the bound and domain*" (*Marchant, page 634, right col., paragraph 7.1, lines 15-18*).

The method of claim 3, wherein evaluating the effect of the received event nodes on the concept nodes, comprises:

computing an indirect effect of events (*predictive event-correlation*) on concept nodes using the equations:

$$I_{px}(E_i, C_i) = \min(e_{px}(E_i, C_j)) = \min(e_{px_{r1}}(E_i, E_k)) \oplus \ldots\ldots \oplus \min(e_{px_m}(E_{kn}, C_j))$$

(*Liu, page 504, right col., lines 10-28*)

wherein the indirect effect of events $E_i$ on concept nodes $C_i$ can be defined as the intersection of the linked causal types and can be described by the above equation, $e_{px}$ is a function which takes $I_{ij}$ to [0,1] in path 'p' i.e. $e_{Iij} = f \rightarrow (I_{ij}, \mu_{ij})$, $\mu_{ij} \in \{0,1\}$, and $\oplus$ represents a concatenation of paths, wherein the concatenation operator $\oplus$ is generally considered as a fuzzy 'and' operator, wherein the operator (t-norm) for intersection of two fuzzy sets other than 'min' can be used using a 'bounded difference', wherein the bounded difference can be computed using the equation:

$$t_1(\mu_A(x), \mu_B(x)) = \max\{0, \mu_A(x) + \mu_B(x) - 1\}$$

wherein $t_1()$ is a t-norm between fuzzy sets A and B with membership functions $\mu_A$ and $\mu_B$.

**Claim 20**

Ndousse-Greineder-Liu-Merchant teach the method of claim 19, wherein mapping the received real-time events to the formed FCM fragments comprises:

correlating the received events to the identified concept nodes to evaluate the effect of the received event nodes on the identified concept nodes using the determined element interdependencies (*Ndousse, page 1559, Figure 2*).

**Claim 21**

Ndousse-Greineder-Liu-Merchant teach the method of claim 20, wherein correlating the received events to the concept nodes further comprises:

accumulating evidence based on the received event nodes (*Ndousse, page 1559, right col.*);

comparing the accumulated evidence to a threshold value (*Ndousse, page 1559, right col.*); and

analyzing the concept nodes based on the outcome of the comparing to evaluate the effect of the received event nodes (*Ndousse, page 1559, right col.*).

**Claim 32**

Ndousse-Greineder-Liu-Merchant teach the computer readable medium of claim 27, wherein evaluating the effect of the received event nodes on the concept nodes, comprises:

computing an indirect effect of events on concept nodes using the equation:

$$I_{px}(E_i, C_i) = \min(e_{px}(E_i, C_j)) = \min(e_{px_{r1}}(E_i, E_k)) \oplus \ldots\ldots \oplus \min(e_{px_m}(E_{kn}, C_j))$$

(*Liu, page 504, right col., lines 10-28*)

wherein the indirect effect of events $E_i$ on concept nodes $C_i$ can be defined as the intersection of the linked causal types and can be described by the above equation, $e_{px}$ is a function which takes $I_{ij}$ to [0,1] in path 'p' i.e. $e_{Iij} = f \rightarrow (I_{ij}, \mu_{ij})$, $\mu_{ij} \in \{0,1\}$, and $\oplus$ represents a concatenation of paths, wherein the concatenation operator $\oplus$ is generally considered as a fuzzy 'and' operator, wherein the operator (t-norm) for intersection of two fuzzy sets other than 'min' can be used using a 'bounded difference', wherein the bounded difference can be computed using the equation:

$$t_1(\mu_A(x), \mu_B(x)) = \max\{0, \mu_A(x) + \mu_B(x) - 1\}$$

wherein $t_1()$ is a t-norm between fuzzy sets A and B with membership functions $\mu_A$ and $\mu_B$.

**Claim 40**

Ndousse-Greineder-Liu-Merchant teach the system of claim 35, wherein evaluating the effect of the received event nodes on the concept nodes, comprises:

computing an indirect effect of events on concept nodes using the equation:

$$I_{px}(E_i, C_i) = \min(e_{px}(E_i, C_j)) = \min(e_{px_{r1}}(E_i, E_k)) \oplus \ldots\ldots \oplus \min(e_{px_m}(E_{kn}, C_j))$$

(*Liu, page 504, right col., lines 10-28*)

wherein the indirect effect of events $E_i$ on concept nodes $C_i$ can be defined as the intersection of the linked causal types and can be described by the above equation, $e_{px}$ is a function which takes $I_{ij}$ to [0,1] in path 'p' i.e. $e_{Iij} = f \rightarrow (I_{ij}, \mu_{ij})$, $\mu_{ij} \in \{0,1\}$, and ⊕ represents a concatenation of paths, wherein the concatenation operator ⊕ is generally considered as a fuzzy 'and' operator, wherein the operator (t-norm) for intersection of two fuzzy sets other than 'min' can be used using a 'bounded difference', wherein the bounded difference can be computed using the equation:

$$t_1(\mu_A(x), \mu_B(x)) = \max\{0, \mu_A(x) + \mu_B(x) - 1\}$$

wherein $t_1()$ is a t-norm between fuzzy sets A and B with membership functions $\mu_A$ and $\mu_B$.

**Claim 59**

Ndousse-Greineder-Liu-Merchant teach the event-correlation system of claim 43, wherein the analyzer evaluates an indirect effect of events on concept nodes using the equations:

$$I_{px}(E_i, C_i) = \min(e_{px}(E_i, C_j)) = \min(e_{px_{ri}}(E_i, E_k)) \oplus \ldots\ldots \oplus \min(e_{px_m}(E_{km}, C_j))$$

(*Liu, page 504, right col., lines 10-28*)

wherein the indirect effect of events $E_i$ on concept nodes $C_i$ can be defined as the intersection of the linked causal types and can be described by the above equation, $e_{px}$ is a function

which takes $I_{ij}$ to [0,1] in path 'p' i.e. $e_{Iij} = f \rightarrow (I_{ij}, \mu_{ij})$, $\mu_{ij} \in \{0,1\}$, and $\oplus$ represents a concatenation of paths, wherein the concatenation operator $\oplus$ is generally considered as a fuzzy 'and' operator, wherein the operator (t-norm) for intersection of two fuzzy sets other than 'min' can be used using a 'bounded difference', wherein the bounded difference can be computed using the equation:

$$t_1(\mu_A(x), \mu_B(x)) = \max\{0, \mu_A(x) + \mu_B(x) - 1\}$$

wherein $t_1()$ is a t-norm between fuzzy sets A and B with membership functions $\mu_A$ and $\mu_B$.

**Claim 60**

Ndousse-Greineder-Liu-Merchant teach the event-correlation system of claim 59, wherein the analyzer maps the received real-time events to the formed FCM fragments by correlating the received events to the identified concept nodes to evaluate the effect of the received event nodes on the identified concept nodes using the determined element interdependencies (*Ndousse, page 1559, Figure 2*).

**Claim 61**

Ndousse-Greineder-Liu-Merchant teach the event-correlation system of claim 59, wherein the analyzer correlates the received events by accumulating evidence based on the received event

nodes and compares the accumulated evidence to a threshold value, and analyzes the concept nodes based on the outcome of the comparing to evaluate the effect of the received event nodes (*Ndousse, page 1559, right col.*)

**CORRESPONDENCE INFORMATION**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mai T. Tran whose telephone number is (571)272-4238. The examiner can normally be reached on 10:00 am - 6:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David R. Vincent can be reached on (571) 272-3080. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/mtt/
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